

## RESEARCH ARTICLE

# The Effect of Colour on the Anchoring Heuristic in Consumer Decision Making

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The purpose of our research was to investigate the effect of colour on cognitive processing styles in social decision-making situations. The present research investigated the effect of colour on estimating the price of a gift for a social target. Two colours, blue and red, were provided as environmental cues, and the motivation for a decision was manipulated, by varying the target person's level of attractiveness in a presentation slide during a gift-purchasing simulation. A blue background with low motivation resulted in the anchoring effect, meaning that participants used heuristic processing. However, for a blue background with high motivation and red backgrounds with both high and low motivational levels, participants were not influenced by any anchoring effect. The results indicated that the effect of colour on cognitive style interacted with the motivational level, the attractiveness of the photo target. The theoretical implications, evolutionary explanation, and ideas for further research are also discussed.

**Keywords:** colour effect; anchoring heuristic; decision making; consumer decision; processing style

## Introduction

Since Herbert A. Simon (1955) embarked on research about the ways humans choose, studies on bounded rationality and decision making have been explored in various fields such as psychology, business management, and economics. Simon (1956), in exploring models of problem solving and information processing, argued that rationality is bounded under the effect of its environment and human needs (see also March & Simon, 1958). The postulation that human rationality is limited has been verified repeatedly in multiple social scientific areas such as sociology (Long, 1958), public policy (Schelling, 1971), organizational studies (Cohen, March, & Olsen, 1972), and psychology (Weiner, 1976; Sproull, Weiner, & Wolf, 1978). These studies have shown converging evidence that the behaviour of choice is based on numerous factors.

Previous research has shown that ambient factors such as music, flooring, scents, and background colour may significantly affect human decisions and behaviour. For example, Hul, Dubé, and Chebat (1997) showed that positively valenced music raises the consumer's powerful positive emotional state. Morin, Dubé, and Chebat (2007) also confirmed that one's evaluation of a service varies by presence or absence of background music. Meyers-Levy, Zhu, and Jiang (2010) discovered the effect of flooring texture on product assessments. Bosmans (2006) reported that ambient scents which are congruent with the product affect a consumer's evaluation. Krishna, Lwin, and Morrin

(2010) showed that facial tissues with infused scent helps participants recall the brand. Based on these precedents, our research predicted that the colour effect during purchasing would form a romantic mood and also have a significant influence on decision making. Crowley (1993) found that retail store environments were perceived by consumers as more active when more extreme wavelength colours (red and blue) are used. Likewise, Bellizzi and Hite (1992) also found that more positive retail outcomes were found with blue environments than with red ones. Furthermore, our study extended its contextual point to social consumer decision making, such as buying a gift for the opposite sex, so that we can discuss the simultaneous influence of colour and the attractiveness of the recipient on the participants. We focused on how this joint effect affects the use of a heuristic in consumer decision making.

## Theoretical Background

### *Anchoring Heuristic in Consumer Judgement*

Heuristic means an experience-based way to perceive, decide, or solve a problem, and this concept helps us to understand human behaviour in the perspective of bounded rationality. Tversky and Kahneman (1974) demonstrate in their experiment that a random roulette ball affected a participant's answer to a question on the percentage of African countries within the United Nations. As a result, participants who received the roulette ball number 10 as an anchor estimated there were 25 while participants who received 65 estimated there were 45. This means that the participants' numeric estimation was affected by the anchor, the roulette ball number. Later studies also confirmed the effect of an anchoring

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heuristic in judgement within various conditions (Hess & Orbe 2013; Loschelder, Stuppi, & Trötschel, 2013; Clepce, Neumann, Martus, Nitsch, Wielopolski, Koch, Kornhuber, Reich, & Thuerlauf, 2014). That is to say, when people try to answer a question that they do not know the answer to, they tend to be affected either consciously or subconsciously by the anchor, which is not related to the question. This is because the anchor acts as a heuristic cue.

Further research on the anchor has been extended to the notion of economic behaviour and numerical estimation. Northcraft and Neale (1987) manipulated the listed price of real estate as an anchor and confirmed that participants were affected by the anchor when they gave their estimation of real estate prices. In their research, students, as amateurs, and real-estate agents, as experts, toured and estimated the price of real estate properties. The research hypothesized that the manipulated listing prices would affect the participants making pricing decisions by acting as anchors. They set four conditions: a low price, a moderately low price, a moderately high price, and a high price. As a result, the anchor's effect on the listing price was confirmed for both amateur and expert participants under each condition. The effect of anchoring heuristic in numerical estimation or the consumer field has been reported in other previous research in that the anchor is effective when it is obviously random and irrelevant (Champman & Johnson, 1999), and that consumers utilise the advertised reference price, an anchor, to their internal reference prices (Chandrashekar & Grewal, 2006). In addition to these, Ritov (1996) reported the anchoring effect in a simulated market negotiation exploring the anchoring level through different profit margins and initial offers. As shown in these studies, the anchoring effect has been demonstrated to have a large impact on one's decision-making processes in consumer and economic situations.

### **Heuristic and Motivation**

The heuristic process is not limited to the intra-personal Dimension. It also works in situations where a person interacts with social partners. Social psychology has examined this issue as a dual-process (Chaiken & Trope, 1999). Chaiken and Ledgerwood (2012) characterized systematic processing as "the attempt to thoroughly understand any and all available information through careful attention, deep thinking, and intensive reasoning" (p. 247), and heuristic processing as "much less demanding in terms of mental work required and much less dependence on having the ability to think carefully about information" (p. 247).

One of the factors which affects these two processes is motivation. According to Chaiken's (1980) Heuristic-Systematic Model (HSM), accuracy motive, impression management motive, and defensive motive affect processing styles. For example, when the accuracy motive is high, systematic processing activates. However, a heuristic activates when the accuracy motive is low (Chaiken, 1980; see also Fazio, 1990; Petty & Cacioppo, 1996). Moreover, Petty and Briñol (2011) postulated that "the attractiveness of the source of a message" (p. 226)

affected the listener's thinking. That is, if the source of the message is attractive, the target listening to the message was more likely to be receptive (Petty & Briñol, 2011; see also Maddux & Rogers, 1980).

However, the social context of our research is different from that of the previous research. The key point of this experiment is buying and giving a gift. The attractiveness of the person receiving the gift does not lead the participant to heuristic processing. Rather, the attractiveness raises the participant's motivation in the decision making, which should make systematic processing salient. This is because the accuracy motive increases relative to the importance of the situation (Petty & Briñol, 2011). With the viewpoint that the purpose of buying and giving a gift is expressing goodwill, then when the consumer selects a gift for an attractive person, the personal relevance would be higher than when he or she selects one for an unattractive recipient. This indicates that the accuracy motive on information processing regarding consumer decision making becomes higher as the recipient's attractiveness and importance increases for the consumer.

### **Colour Effects on Judgement**

Colour, such as the background colour on shopping websites and the colour of interior design and lighting in shops, is one of the factors which has a significant impact on judgement. There has been various research conducted on the effect of colour on the human mind and human behaviour, however each has reported mixed results on what and how the effect works. On the one hand, some investigators explained the colour effect is mediated by mood. For example, Cheng, Wu, and Yen (2009) tested the effect of colour in stores and website designs on consumers' mood states and on stimulating shopping behaviours. Their research reported that colour factors had a significant effect on the participants' emotional response, which in turn influenced their intention to purchase. Specifically, participants felt more aroused and pleased when they were exposed to a warm colour website than those people who experienced cool colours. In addition, both pleasure and arousal were significant predictors of approach-avoidance intention.

Moods are regarded as having a substantial effect on information processing and judgements (Forgas, 1992, 1993a, 1993b; Mayer, 1986; Mayer, Gaschke, Braverman, & Evans, 1992; Sedikides, 1992). From a social psychological perspective, the cognitive strategy for decision making can be stated as tuning into the mood states (Bless, Bohner, Schwarz, & Strack, 1990). That is to say, cognitive tuning uses mood states as feedback from the outside or from the environment. Specifically, for a positive mood, the additional effort needed to gain information is not necessary, rather a person uses the information that he or she already has. That is, positive moods make people utilise heuristic process through the general knowledge structure (Forgas & Vargas, 2000; Forgas, 1995). Contrarily, a negative mood works as a cue to invoke a person to begin using a more cognitive way of thinking (Forgas & Vargas, 2000; Forgas, 1995). This way of thinking leads to the

systematic process, which tries to adopt new information and then analyse it (Forgas & Vargas, 2000; Forgas, 1995; Forgas, 1994). Hence, the effect of colour on judgement can be studied in the mood-mediated processes (Bless & Fiedler, 2006; Piaget, 1954).

On the other hand, colour can invoke its effect without mood mediation. According to Soldat, Sinclair, and Mark (1997), the effect of colour can independently affect an individual's cognitive style. By providing a problem-solving task to participants, they showed that an environmental cue, like colour, directly affects processing strategy in a certain condition. Chebat and Morrin (2007) investigated the effects of warm and cool colour mall décor on consumers. French-Canadians perceived higher product quality when a warm colour décor whereas Anglo-Canadians did so with a cool colour. Based on their analysis, the mall décor did not impact shoppers' moods significantly. This result implies that the atmospheric décor of a mall affects consumer's perception through a cognitive mediational route than an affective mediational one.

To sum up, many previous studies have investigated the effect of colour on decision making under various conditions. However, the reported results of whether its mechanism is mediated by mood or not is mixed. Thus, our research was designed to test the interaction between social motivation and colour on a heuristic as well as whether it is mediated by mood or not.

### **The Present Research**

Using the previous research that the cognitive processing style is influenced by the effect of colour, and that the processing style is affected by motivation, the present research tried to confirm how colour influences decision making with an interaction of motivation conditions. Moreover, the study explored whether the effect of colour on consumer decision making is influenced by mood or not.

The present research designated the colour blue as the cool colour and the colour red as the warm colour based on previous research (Bellizzi & Hite, 1992; Chebat & Morrin, 2007). Blue is considered the coolest colour and generally considered to be the opposite of red. In our research, blue- and red-coloured backgrounds were expected to affect participants as different cues. The cool colour (blue) and the warm colour (red) would invoke different processing styles in the participants who were faced with a consumer-based decision situation. Specifically, participants in the warm colour condition were expected to use a more systematic process since they would not have been affected by the heuristic cue, whilst the participants in the cool colour condition were expected to use a more heuristic process since they would have been influenced by the heuristic cue.

In addition to this, the effect of colour was expected to be moderated by differing levels of motivation in each situation. Specifically, with participants who were given low motivation (less attractive gift recipients), the different colours would change the style of decision making. However, with participants who were in the high motivation condition (attractive gift recipients), colour would not impact

on decision making. Therefore, only participants who were given low motivation and a cool colour background were expected to be influenced by the anchoring heuristic.

## **Methods**

### **Participants and Design**

A total of 72 undergraduate students (42 male and 30 female) ranging in age from 18 to 27 ( $M = 22.0$ ,  $SD = 2.0$ ) participated in the experiment. The study population consisted of students from Sungkyunkwan University (SKKU) in the Republic of Korea with various majors (e.g., Confucian and oriental studies, law, business administration, psychology, economics, and statistics). Participant selection was conducted on the Internet through Facebook (<http://www.facebook.com>), a social networking service, and SKKU Love (<http://www.skkulove.com>), the community website for SKKU students. Each participant received 2,000 Korean Won (KRW), approximately 1.5 Euros, as a reward. This experiment was a  $2 \times 2$  factorial design. All participants were randomly assigned to one of four conditions: blue or red and either high or low attractiveness. The main dependent variable was the estimated price of a planner.

### **Materials**

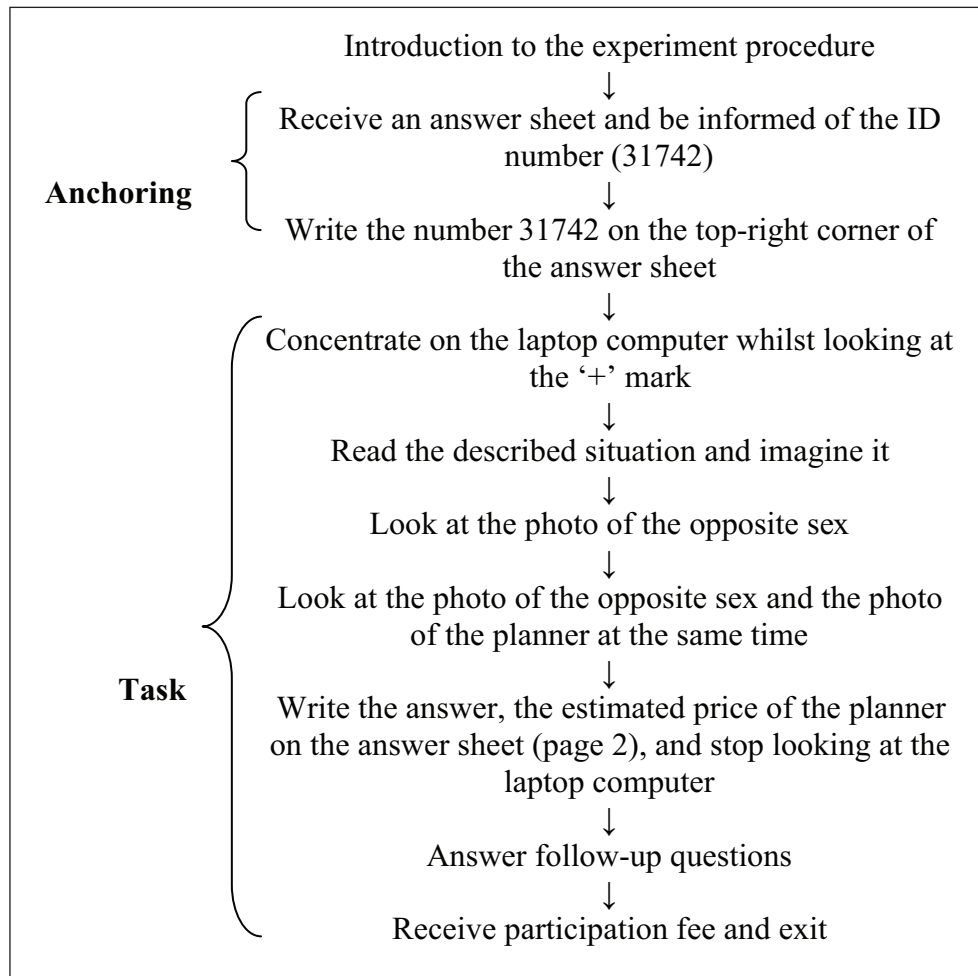
To test the effect of colour on mood, the Profile of Mood State (POMS) was used. Since the participants were Korean college students, we used the Korean edition of the POMS (K-POMS) which was specifically designed for Koreans in order to apply a better tool for testing the participants' mood (Lee, Lee, and Kohlman, 1999; Kim, 2001). Nine questions were answered on the answer sheet: five were selected from the wide-ranging emotional factors of anxiety and fear such as nervous, anxious, and scared. The other four were selected from general emotional factors such as comfortable and relaxed, lively, concentrating and stressed, and annoyed. Each question was analysed independently.

### **Procedure**

**Pilot study.** Before the main experiment, a pilot study was performed on 20 Sungkyunkwan University students who were different from the participants in the main experiment. They were asked to estimate the price of four individual presents. Among the four presents, a cake, a muffler, a glove, and a planner, the planner was chosen as the object for the main experiment because it had the largest price variance with its average price being 16,250 KRW.

**Main experiment.** Given the baseline of the estimated cost of the planner from the pilot (16,250KRW), we hypothesized that the closer the participants to the number 31742 for their estimation, the more participants were affected by the anchor. That is to say, if a participant estimated the price to be 29,000 KRW, it could be determined that he or she had used an anchoring effect.

When the participants entered the room, the experimenter distributed the answer sheet to the participant, and then informed them their ID number was 31742. The experimenter introduced the ID number as a randomly



**Figure 1:** Summary of Task Procedure.

generated one, and the participants were asked to write the number in the top-right corner of their answer sheet. This ID number was really used in order to invoke the anchoring effect based on the research of Kristensen and Gärling (1997).

The experiment was carried out in two of the study rooms (one was a waiting room and the other one was an experimentation room) in the Central Library of Sungkyunkwan University between November 28 and December 1, 2012. The same rooms were used for all days. The participants waited for their turn in a waiting room, and then went into the experimentation room one by one. Participants were told that they would solve a task for about 10 minutes, but the real time spent was about four to six minutes. The experimenter explained that the task was designed to identify the decision-making processes of college students. **Figure 1** summarizes the experimental procedure.

The task was prepared using a Microsoft™ PowerPoint, and two background colours—blue or red—were applied. The participants were instructed to solve the task. The background colour shown to each participant was not changed during the task.

A table, a laptop computer (approximately 367.9mm × 242.9mm, light emitting diode), and a big television (approximately 1012mm × 698mm, plasma display panel)

were prepared in the experiment room. Participants were seated at the table facing the laptop computer. The monitor was on the wall and displayed the same background colour of the condition the participants were assigned to in order to increase the effect of the background colour. Also to intensify the effect of the background colour on the participant, the experimenter asked the participant to concentrate on the plus symbol, +, on the laptop computer for 10 seconds. The experimenter then asked the participants to read the description on the laptop computer and to imagine that he or she was in a real situation. The description read: "You are now preparing to buy a present for somebody for the upcoming Christmas holiday. The next photo will show the person who will receive your present." The participants were constantly exposed to the background colour whilst they were shown the questions and the photo of a target. The font colour was always identical, white, for all materials.

A single photo of a target of the opposite sex was displayed in order to let the participant focus only on the photo. The photos had already been chosen in advance from a pilot study with an independent participant pool ( $N = 24$ , 12 female and male each). In the pilot test, 16 photos (eight male and female models) were provided to participants, and they stated the attractiveness of each person on a 7-point Likert scale. The most attractive photo



	High Attractiveness		Low Attractiveness	
	Blue	Red	Blue	Red
Mean	15935.50	17611.11	15915.78	9461.54
Standard Deviation	8061.37	5214.67	8305.30	4701.34

**Table 1:** Means of the Estimated Price with the Independent Variables.

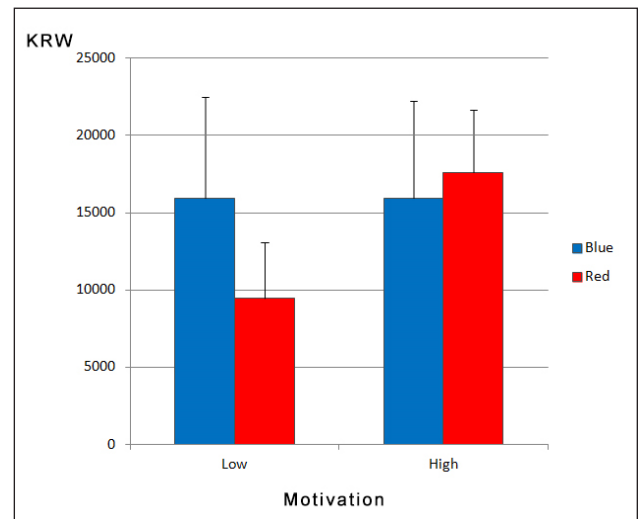
( $M = 5.83$ ,  $SD = 1.27$  for the attractive male target;  $M = 6.11$ ,  $SD = 1.03$  for the attractive female target) and non-attractive photo ( $M = 1.75$ ,  $SD = 0.75$  for the non-attractive male target;  $M = 1.75$ ,  $SD = 1.04$  for the non-attractive female target) were decided. Because all of the participants were undergraduate students at Sungkyunkwan University, the photos had been prepared using students from other universities in Korea with their permission so that the participants would not have met the target in the photo prior to the experiment. During the main experiment, only one photo was distributed to each participant. The photo of a target of the opposite sex and the photo of a day planner were used together in this step. The participant was then asked to write down the estimated price of the planner, assuming the planner would be a gift for the target shown during the presentation. As soon as the participant wrote the estimated price, they were asked to stop looking at the laptop computer. With the follow-up questions on the answer sheet, three points were tested: subsidiary measure (i.e., check the participant's mood), manipulation check, and suspicion check. After the participants answered all of the questions, they were thanked for their participation and received 2,000 Korean Won (KRW) as their participation reward. In addition to this, they were informed that they would be thoroughly debriefed later by email from the researchers after all experiments had finished in order not to influence other future participants. The participants were debriefed seven days after the main experiment finished by email.

## Results

Among the 72 participants, seven participants' results were excluded because they realized the purpose of the research whilst participating in the experiment. Therefore, a total of 65 participants' responses were analysed, and gender effects were controlled.

### Manipulation Check

At the manipulation check, we analysed whether the participants actually perceived the given photos at the intended level of attractiveness. For instance, the analysis checked whether participants rated the level of attractiveness to determine if it was consistent with the condition they were assigned to. This was done for both conditions. Homogeneity of the variance test between conditions was satisfied, and the mean difference between conditions was significant ( $t = 3.301$ ,  $p < .05$ ). Specifically, after viewing a photo of a recipient, we asked participants how attractive the target was (the photo of a recipient) on a 7-point scale. The participants in the attractive target condition stated a higher level of attractiveness ( $M = 4.72$ ) than that



**Figure 2:** Comparisons of the Estimated Gift Prices.

of participants in the normal attractive target condition ( $M = 3.70$ ).

In addition, the answers to the K-POMS were analysed in order to test the effect of colour on the participants' mood. Among the 65 answers, two were written unclearly and were therefore excluded from the analysis. The analysis of the 63 answers showed that there were no significant differences between reported levels of mood ( $t = .609$ , ns).

### Hypothesis Testing

The data were analysed by a 2 (target attractiveness)  $\times$  2 (colour) ANOVA. The analysis revealed a significant target attractiveness  $\times$  colour interaction on estimated price,  $F(3,61) = 5.60$ ,  $p < .05$ . **Table 1** summarizes the findings. An analysis of simple effects confirmed an effect of colour on estimated price when the target's attractiveness was low ( $p < .05$ ) as can be seen in **Figure 2**. Participants' estimations in the blue-colour condition ( $M = 15915.78$ ) were higher than those in the red-colour condition ( $M = 9461.54$ ).

The significant difference in the low motivation condition is further explained by the anchor. The researchers determined how close to or far away the estimated price was from the anchor, which had been given in the form of the random ID number 31742. When faced with a low motivational situation, participants with the blue background were closer to the anchor than those with the red background. This result was due to the participants using a heuristic process to estimate the price of the planner. That is, participants in the blue colour condition estimated the price to be closer to the number 31742 as they were influenced more by the anchor, the ID number,

when faced with a low motivational situation. In contrast, participants in the red and low motivation condition were influenced less by the anchor. On the other hand, participants in the high motivation condition did not show any difference between the colour manipulations. This result can be explained by participants using a systematic process to estimate the price of the planner. To sum up, we can say that the participants given the blue background with low motivation utilised the anchoring effect because they reported a higher price than the participants shown the red colour, and there was no difference between the two colour conditions in the high motivation condition.

### **Effects on Mood**

In addition, the answers were analysed in order to test the effect of colour on the participants' mood. Among the 65 participants' answers, two were written unclearly, and were therefore excluded from the analysis. The analysis of the 63 answers showed that there was no significant relationship between the conditions and mood.

The mean of the estimated gift prices in the four conditions is expressed by a bar graph; the mean values for the conditions of low and high motivation are 12,688 KRW and 16,773 KRW respectively.

### **Discussion**

The purpose of this study was to investigate the effect of colour on consumer decision making by applying two background colours, blue and red, and motivational factors, attractive and normal photos of a target to receive a gift. Participants with a blue background with low motivation, normal photo target condition, used the anchoring heuristic when they estimated the price of the planer as a gift. However, participants with a blue background with high motivation, attractive photo target, and in a red background with both low and high motivations did not follow heuristic processing. The results supported the hypothesis that the different colours would change the style of decision making. It also supported the hypothesis that this colour effect would be moderated by levels of motivation (the degree of attractiveness of the gift recipients).

These findings are important in light of the fact that a consumer decision is originally a motivational process, and they illustrate that the decision making is influenced by the environment. Some people might say that this result occurred solely due to preference of the attractive model of the opposite sex. However, the main effect by the attractiveness of the recipient did not occur because the red and blue colour showed different effects in the same conditions. If this research showed that the only main effect was caused by the figure's photo, the result would not indicate any differences between the effects of a red and blue background together with a picture of a highly attractive person of opposite-sex.

For the motivation factor in the experiment, an alternative idea could be suggested, such that during the cognitive processing, the attractiveness of the target did not produce the moderation effect of motivation, but merely a different baseline regarding how much money to pay. This means that if baselines with high motivation and low

motivation were different, we could not tell if the motivational effect had any impact. However, in this research, the participants in the low motivation with blue background condition had a higher spending threshold. This shows that the effect of motivation, manipulated by the attractiveness of a photo, significantly impacted the cognitive processing with the effect of colour.

Our research has a different significance in that it expanded on the previous research of Soldat et al. (1997), which emphasised the effect of external affective signals such as colour, and replicated it using Korean participants. In addition to this, our study tried to extend the type of the cognitive task used by adopting a social cognitive task, which involves consumer-based decision making regarding an attractive or an average-looking target, rather than using a highly cognitive task. With these points in mind, we can conclude that the results of our research have more external validity, and that the study has revealed the underlying mechanism of the effect of colour on decision making by manipulating the social motivation.

One point of interest in our results is that the effects of red and blue conflict with what Soldat et al. (1997) reported. They hypothesized that red conveys a positive affect that leads to non-systematic processing. In the present study, however, the blue colour was expected to invoke a less cautious state which would lead participants to use heuristic processing (e.g., Cheng et al., 2009).

Of course, in order to minimize experimental errors of manipulating colour, the following criteria are suggested. First, it is necessary to specify in detail the purpose and function of manipulating colour for the experiment. For the case of red, the red may play a role as a warm colour, but it also can increase the participant's sense of caution. Therefore, future research should stipulate the function of each colour in detail. Second, the method used to expose participants to colours is a factor which may incur different results among various studies. Soldat et al. (1997) used white and coloured paper for colour manipulation, whilst our research utilised computer and television monitors for displaying colours to participants. These different methods could deliver a different quality to participants. In addition to this, the intensity of illumination in the room of the experiment may affect the colour quality. Lastly, with accumulating research in the field of colour psychology, replication of various colour conditions will contribute towards further research. In consideration of the fact that the colours we are faced with in everyday life are very complex, future research with detailed colour conditions will further clarify the effect of colour and related issues more robustly.

From an extended viewpoint, we need to consider in detail which mechanisms the effects of colour go through. The current research used the K-POMS to examine the mood of the participants, but no significant differences between conditions were discovered. This may be because the effect of mood is too subtle for measurement. For this matter, some research shows differing results. According to Soldat et al. (1997), the participants' thought processes in problem solving can be analysed even though mood was not designated as mediation (see also Chebat &

Morrin, 2007). They explain that colour can convey affect, but it does not pass through mood. Rather, colour affects the cognitive processing style as an environmental cue. This could explain our results. Future research is recommended to learn more about the details of this mediation mechanism on mood.

The current study is a part of an attempt to demonstrate that the social character (target) is an influencing factor even in the realm of decision making and reasoning. Human beings learn early on how to establish relationships with others and lead them amicably. As people are social to the core, we are usually attracted by certain social situations. The situation of purchasing and giving a gift for a recipient of the opposite sex, which the present research manipulated, is also classified as behaviour based on an ultimate cause for adapting to an environment called the social relationship context.

Together with this, we can discuss how colour, an environmental factor, has an effect on human decision making and reasoning from an evolutionary viewpoint. The ways in which each individual follows cognitive styles are diverse, and sometimes it is needed to select a functional one. One of the representative signals informing a person about their environment is the colour surrounding him or her. Human beings perceive the information of an object within the dominant colour in the visual field. In this way, the colour is a comprehensive cue indicating the situation that the person is faced with (Nathans, 1999). Based on the point that perception becomes a foundation of doing something (James, 1891), perceiving colour would be intertwined with the decision making process to guide human behaviour (Gibson, 1986; Gibson, 2004). We believe this the ultimate cause for human beings associating colour with mood, emotions, and cognitive processing.

## Conclusion

Our research demonstrates that the environmental factors which affect each person's decision can be mediated by social relationships or contexts. In everyday life, people are faced with a number of situations in which they must decide or choose to do something. These inevitably rely on social influence, which is especially true when we have a social purpose. In addition, this research adds to the knowledge that people's perceptions, social motivation, and their cognitive manifestation are connected to each other. Therefore, we can conclude that environmental cues such as colour, personal characteristics, social relationship with others, and cognitive processing work intimately with one another to affect human decision-making processes.

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